DRAFT

TUCSON AMA SAFE-YIELD TASK FORCE
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ISSUE: CLIMATE VARIABILITY IN THE CONTEXT OF SAFE-YIELD

Current methods used to project future water demand and supply do not adequately take climate factors into account. Failure to incorporate the full range of potential climate variability as well as long-term trends in climate change may result in negative economic impacts that could have been avoided. The possibility of longer term or more severe drought occurring in Arizona has not been adequately planned for.

BACKGROUND

Since the Groundwater Management Act was signed into law in 1980, knowledge gained from climate and hydrologic science has grown substantially. For example, we now know much more about El Niño and La Niña processes and how these processes affect the Southwest. As a result, winter temperature and precipitation forecasts during El Niño and La Niña years have improved substantially, and can now be issued with a fairly high level of confidence six months or more in advance. Likewise, research into past climates has increased our knowledge of the range of conditions that have existed in this area and has allowed us to identify the extremes that the area has experienced. Based on such research, we have evidence of conditions such as deep droughts that have affected the entire Colorado River watershed, including the Salt, Verde, and Gila River tributaries. At the same time the science of climate modeling continues to improve. Considerable work is currently underway to develop regional models that more accurately reflect processes, such as our Southwest Monsoon, that are not well depicted in the global or continental-scale models. The outputs of such models are beginning to provide plausible future temperature and precipitation scenarios for time periods of up to 100 years. Given these emerging trends, including a wider range of climate information in planning and management will become ever more important.

Recent climate research indicates that the Southwest may be heading for a drought cycle that could be more severe than any experienced in recent decades. At the same time, historical records and results from modeling changes in the global climate conditions indicate that there is a fair chance of increased precipitation and flooding in the Southwest over the longer term (up to 100 years).

It is clear that both demand for water and water supplies are related to weather conditions in ways that are predictable and may affect the success of management programs. There is a need to incorporate the latest available information in both planning and regulatory programs, and to increase the planning horizon beyond 2025.

SOLUTIONS CONSIDERED

The following ideas have been considered. Additional ideas may be added to this list.

- Incorporate a range of alternative climate scenarios in ADWR hydrologic models. These scenarios, derived from paleo and historical climate information as well as from carefully selected general circulation model (GCM) results, should reflect unusually wet and dry periods, as well as "average" conditions.
- Ensure that hydrologists associated with ADWR and with water providers are trained in the interpretation and use of climate information and forecasts as well as ways of accessing data that are useful to water managers, such as planning for infrastructure development.
- Evaluate the impacts of climate variability and change on implementation of ADWR programs such as assured water supply, groundwater recharge and recovery needs, transferability of water rights, rules governing transportation of water, and the function of the Arizona Water Bank.
- Require the ACC to take drought planning and flood control impacts into account in rate analysis cases.
- Require development of a long-term, multi-agency drought contingency plan that explicitly reflects changes in climatic conditions over time scales ranging from seasonal to multi-decadal, and beyond.
- Incorporate the effects of weather in implementation and assessment of the effectiveness of conservation programs.

PRELIMINARY RECOMMENDATIONS

- The state should develop a drought plan that identifies appropriate responses to varying levels of drought, including contingencies to respond to more severe drought than has been experienced in recent decades (use the New Mexico drought plan as a starting point).
- ADWR should proactively engage in ongoing training of technical and planning staff to ensure that the most current climate information is used as a backdrop for all planning, projections, program implementation and decision making.
- The time horizon for projections should be expanded to incorporate longer-term climatic trends, including consideration of the impacts of wetter and dryer climatic conditions, higher temperatures and shifts in seasonal precipitation.
- Programs that are designed to respond to long-term drought on the Colorado, such as the AWBA, should be proactively evaluated to ensure that the water stored is recoverable and water supplies are reliable in the context of unexpected climate extremes.

OBSERVATIONS

Climate and hydrologic research, as well as longer-term forecasts, are certainly not new; but knowledge about climate and its links with hydrology has increased substantially in sophistication and complexity over the past few decades. Coming up to speed on

understanding the new developments is challenging. However, by making the effort, water managers can do a better job of averting or ameliorating negative climate impacts on water resources. Likewise, a better-developed climate framework allows decision makers to identify and take advantage of new opportunities when they arise, such as planning for environmental restoration or banking of extra water during extended periods of higher than usual precipitation.

ADWR should develop alternative scenarios that more accurately reflect the high degree of climate variability typical of this region. Incorporation of data on maximum and minimum historical conditions, as well as projections for possible future conditions derived from climate models, into the Department's hydrologic models is recommended. Also recommended is consideration of a greater range of climatic variation in institutional and infrastructural planning, conservation efforts, and general water management practices.